

60° and east of the Rocky Mountains. The lightning discharge between clouds at low altitudes or between them and the earth requiring, as it does, higher temperatures, more aqueous vapor, and more rapidly ascending currents, is characteristic of the areas of low pressure, and especially of the quadrant of southerly winds, as was then pointed out; while auroras, requiring lower temperature, less vapor, and probably spiculæ of ice such as attend the formation of snow, are characteristic of the upper layers over the region intermediate between the areas of lowest and highest pressures, and where the ascending air of the low pressures is spreading horizontally above while the descending air of the areas of high pressure is spreading horizontally below.

The meteorological conditions necessary to the production of the auroral light may be either widespread or local. The principal condition seems to be the presence of a layer of air in which moisture is condensing into minute spiculæ of ice; this condition prevails over the broad zones around the earth within 30° of the north and south poles throughout the greater portion of the year, and it may possibly prevail in the upper atmosphere throughout the year much nearer the equator; this condition also prevails especially on the northern side of the areas of low pressure, or storm centers, and therefore on the easterly quadrant of the areas of high pressure. But notwithstanding this favorable meteorological condition, there can be no aurora without a special discharge of electricity.

The ultimate origin of electrical disturbance may be either cosmical or terrestrial. If the former, then auroras are subject to periods of 1, 11, or 55 years; but if the latter, and especially in so far as this disturbance is piezo-electrical, there will be lunar and solar tidal periods, and there may also be localities of special frequency, such as the auroral zone in northern latitude 55° to 70°. It is thus plain that the aurora depends on the one hand on the condition of the atmosphere and on the other hand on the condition of the interior of the earth and the sun. When an electrical disturbance from the sun, or from the interior of the earth, reaches the earth's atmosphere it will produce an auroral light in those portions of the atmosphere whose conditions are favorable thereto, but not otherwise. The two conditions must combine in order to produce the auroral effect.

EARTH CURRENTS AND MAGNETIC STORMS.

The electrical disturbances known as "earth currents" in telegraphy and "magnetic storms" in terrestrial magnetism, are a part of the same system of atmospheric phenomena. Reports of earth currents and magnetic storms have not been received during October, but will be included in future numbers of this REVIEW if any observers report upon these subjects to the Weather Bureau, as it is desirable that the REVIEW should deal comprehensively with all matters bearing on the weather of the month.

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for October, 1893, of the directors of the various state weather services:

ALABAMA.

Temperature.—The mean was 1.5 below the normal; maximum, 95, at Eufaula, 8th; minimum, 22, at Decatur, 31st; greatest monthly range, 64, at Newburg; least monthly range, 36, at Birmingham.

Precipitation.—The average was 0.18 below the normal; greatest monthly, 8.56, at Mobile; least monthly, 0.10, at Clanton.

Wind.—Prevailing direction, north.—*W. M. Dudley, Observer, Weather Bureau, Montgomery, director.*

ARIZONA.

Temperature.—Maximum, 101, at Fort Mohave, 14th; minimum, 23, at Flagstaff, 2d; greatest monthly range, 63, at San Carlos; least monthly range, 39, at Lochiel.

Precipitation.—Greatest monthly, 0.40, at Buckeye and Payson; least monthly, 0.00, at several stations.

Wind.—Prevailing direction, southwest.—*W. Burrows, Observer, Weather Bureau, Tucson, director.*

ARKANSAS.

Temperature.—The mean was 0.8 above the normal; maximum, 99, at Rison, 1st; minimum, 23, at Keesees Ferry, 29th; greatest monthly range, 69, at Rison; least monthly range, 40, at Mount Nebo.

Precipitation.—The average was 0.92 below the normal; greatest monthly, 3.43, at Corning; least monthly, 0.25, at Arkansas City and Prescott.

Wind.—Prevailing direction, south.—*F. H. Clarke, Local Forecast Official, Weather Bureau, Little Rock, director.*

CALIFORNIA.

Temperature.—The mean was 1.0 below the normal; maximum, 102, at Salton, Indio, and Volcano Springs, 8th; minimum, 20, at Boca and Cisco, 16th; greatest monthly range, 68, at Tulare; least monthly range, 25, at Point Lobos.

Precipitation.—The average was 0.80 below the normal; greatest monthly, 6.22, at Crescent City; least monthly, 0.00, at a number of stations.

Wind.—Prevailing direction, west.—*J. A. Barwick, Observer, Weather Bureau, Sacramento, director.*

COLORADO.

Temperature.—The mean was 1.0 below the normal; maximum, 90, at Lamar, 9th, and Minneapolis, 7th; minimum, —2, at Pikes Peak, 26th.

Precipitation.—The average was 0.20 below the normal; greatest monthly, 4.10, at Pikes Peak; least monthly, 0.00, at several stations.

Wind.—Prevailing direction, west.—*J. J. Gilligan, Observer, Weather Bureau, Denver, director.*

FLORIDA.

Temperature.—Maximum, 95, at Plant City, 2d; minimum, 41, at Moseley

Hall, 31st; greatest monthly range, 48, at Archer; least monthly range, 20, at Key West.

Precipitation.—Greatest monthly, 11.72, at Jupiter; least monthly, 0.94, at Brookville.

Wind.—Prevailing direction, northeast.—*E. R. Demain, Observer, Weather Bureau, Jacksonville, director.*

GEORGIA.

Temperature.—Maximum, 95, at Darien, 3d; minimum, 24, at Clayton and Lafayette, 31st; greatest monthly range, 61, at Ramsey; least monthly range, 36, at Dublin.

Precipitation.—Greatest monthly, 6.91, at Savannah; least monthly, 0.30, at Piscola.

Wind.—Prevailing direction, northwest.—*Park Morrill, Local Forecast Official, Weather Bureau, Atlanta, director.*

IDAHO.

Temperature.—Maximum, 80, at Oakley, 8th; minimum, 3, at Martin, 30th; greatest monthly range, 62, at Bonanza City and Martin; least monthly range, 37, at Fort Sherman.

Precipitation.—Greatest monthly, 5.52, at Grangeville; least monthly, 0.02, at Martin.

Wind.—Prevailing direction, southwest.—*J. H. Smith, Observer, Weather Bureau, Idaho Falls, director.*

ILLINOIS.

Temperature.—The mean was 1.0 above the normal; maximum, 92, at Greenville, 9th; minimum, 15, at Dixon and Philo, 30th, and at Aurora, 31st.

Precipitation.—The average was 1.54 below the normal; greatest monthly, 6.55, at Jordans Grove; least monthly, trace, at Bushnell.

Wind.—Prevailing direction, south.—*John Craig, Observer, Weather Bureau, Springfield, director.*

INDIANA.

Temperature.—The mean was 1.2 above the normal; maximum, 86, at Bedford, 13th, at Union City, 10th, and at Vevay, 11th; minimum, 17, at Lafayette, 30th; greatest monthly range, 68, at Lafayette; least monthly range, 52, at New Albany and Columbia City.

Precipitation.—The average was 0.79 above the normal; greatest monthly, 6.18, at Bedford; least monthly, 1.57, at Lafayette.

Wind.—Prevailing direction, southeast.—*Prof. H. A. Huston, Lafayette, director; C. F. E. Wappenhans, Local Forecast Official, Weather Bureau, assistant.*

IOWA WEATHER AND CROP SERVICE.

Temperature.—Maximum, 94, at Glenwood, 10th; minimum, 10, at Emmetsburg, 29th; greatest monthly range, 75, at Emmetsburg; least monthly range, 50, at Hopkinton.

Precipitation.—Greatest monthly, 4.56, at Blakeville; least monthly, 0.02, at Algona.—*J. R. Sage, Des Moines, director; G. M. Chappel, Local Forecast Official, Weather Bureau, assistant.*

KANSAS.

Temperature.—The mean was 0.9 above the normal; maximum, 97, at Sterling, 9th; minimum, 18, at Mankato, 29th; greatest monthly range, 71, at Manhattan and Oswego; least monthly range, 64, at Emporia.

Precipitation.—The average was 1.52 below the normal; greatest monthly, 1.82, at Oswego; least monthly, 0.00, at McPherson, Rome, and Wallace.

Wind.—Prevailing direction, south.—*T. R. Jennings, Observer, Weather Bureau, Topeka, director.*

KENTUCKY.

Temperature.—The mean was 2.9 above the normal; maximum, 90, at Harrodsburg, 10th and 11th; minimum, 19, at Eubank, 30th and 31st; greatest monthly range, 70, at Harrodsburg; least monthly range, 83, at Hendricks.

Precipitation.—The average was 1.90 above the normal; greatest monthly, 7.38, at Catlettsburg; least monthly, 1.50, at Matlock.

Wind.—Prevailing direction, southwest.—*Frank Burke, Local Forecast Official, Weather Bureau, Louisville, director.*

LOUISIANA.

Temperature.—The mean was 1.6 below the normal; maximum, 98, at Cameron, 2d; minimum, 29, at Covington, 15th and 16th.

Precipitation.—The average was 1.30 below the normal; greatest monthly, 6.57, at Sugar Experiment Station; least monthly, 0.15, at Melville.

Wind.—Prevailing direction, north.—*R. E. Kerkam, Local Forecast Official, Weather Bureau, New Orleans, director.*

MARYLAND.

Temperature.—Maximum, 88, at Cambridge, 3d; minimum, 18, at Sunnyside, 31st; greatest monthly range, 68, at Sunnyside; least monthly range, 47, at Solomons.

Precipitation.—Greatest monthly, 6.40, at Valley Lee; least monthly, 2.59, at Darlington.

Wind.—Prevailing directions, northwest and southeast.—*Dr. William B. Clark, Johns Hopkins University, Baltimore, director; Prof. Milton Whitney, Maryland Agricultural College, secretary and treasurer; C. P. Cronk, Observer, Weather Bureau, in charge.*

MICHIGAN.

Temperature.—The mean was 0.9 above the normal; maximum, 90, at Climax, 12th; minimum, 16, at Crystal Falls, 30th; greatest monthly range, 68, at Fitchburg; least monthly range, 40, at Arbela.

Precipitation.—The average was 0.62 above the normal; greatest monthly, 5.94, at Sand Beach; least monthly, 2.14, at Ewart.

Wind.—Prevailing direction, southwest.—*E. A. Evans, Local Forecast Official, Weather Bureau, Detroit, director.*

MINNESOTA.

Temperature.—The mean was 1.3 above the normal; maximum, 86, at Winona, 10th; minimum, 0, at Sauk Center, 29th; greatest monthly range, 78, at Milan; least monthly range, 52, at Duluth.

Precipitation.—The average was 0.92 below the normal; greatest monthly, 3.56, at Saint Charles; least monthly, trace, at Sandy Lake Dam.

Wind.—Prevailing direction, northwest.—*E. A. Reals, Observer, Weather Bureau, Minneapolis, director.*

MISSISSIPPI.

Temperature.—The mean was 3.0 below the normal; maximum, 103, at Yazoo City, 2d; minimum, 25, at Aberdeen, 30th.

Precipitation.—The average was above the normal; greatest monthly, 8.00, at Biloxi; least monthly, 0.00, at Kosciusko.

Wind.—Prevailing direction, north.—*R. J. Hyatt, Local Forecast Official, Weather Bureau, Vicksburg, director.*

MISSOURI.

Temperature.—The mean was 1.1 above the normal; maximum, 95, at Fayette, 1st; minimum, 16, at Half Way, 15th; greatest monthly range, 67, at New Hartford and Potosi; least monthly range, 45, at Gordonville.

Precipitation.—The average was 1.95 below the normal; greatest monthly, 6.26, at Gordonville; least monthly, 0.00, at Conception and Tindall.

Wind.—Prevailing direction, south.—*J. R. Rippey, Secretary, State Board of Agriculture, Columbia, director; E. H. Nimmo, Observer, Weather Bureau, assistant.*

MONTANA.

No report was received from this service in time for this REVIEW.

NEBRASKA.

Temperature.—The mean was 0.4 above the normal; maximum, 95, at Fairbury, 8th; minimum, 10, at Whitman, 29th; greatest monthly range, 75, at Hebron; least monthly range, 46, at Burwell.

Precipitation.—The average was 1.58 below the normal; greatest monthly, 0.86, at Hartington; least monthly, 0.00, at Ansley and Nesbit.

Wind.—Prevailing direction, northwest.—*George E. Hunt, Local Forecast Official, Weather Bureau, Omaha, director.*

NEVADA.

Temperature.—The mean was 2.3 below the normal; maximum, 94, at Gold Hill, 28th; minimum, 8, at Stofiel, 10th; greatest monthly range, 78, at Elko; least monthly range, 86, at Pioche.

Precipitation.—The average was 0.31 below the normal; greatest monthly, 0.64, at Palisade; least monthly, 0.00, at several stations.

Wind.—Prevailing direction, southwest.—*Prof. Charles W. Friend, Carson City, director; F. A. Carpenter, Observer, Weather Bureau, assistant.*

NEW ENGLAND.

Temperature.—The mean was 2.7 above the normal; maximum, 88, at Andover, 9th; minimum, 11, at West Milan, 31st; greatest monthly range, 69, at West Milan; least monthly range, 30, at Nantucket.

Precipitation.—The average was 0.11 above the normal; greatest monthly, 7.37, at Mayfield; least monthly, 0.93, at Cornwall.

Wind.—Prevailing direction, northwest.—*J. Warren Smith, Observer, Weather Bureau, Boston, director.*

NEW JERSEY.

Temperature.—The mean was 0.9 above the normal; maximum, 85, at Vineland, 9th; minimum, 17, at Charlotteburg, 31st; greatest monthly range, 61, at Somerville and Toms River; least monthly range, 41, at Oceanic.

Precipitation.—The average was 1.03 above the normal; greatest monthly, 6.59, at Tenafly; least monthly, 1.74, at Atlantic City.

Wind.—Prevailing direction, northwest.—*E. W. McGann, Observer, Weather Bureau, New Brunswick, director.*

NEW MEXICO.

Temperature.—Maximum, 92, at Fort Wingate, 17th; minimum, 14, at Halls Peak, 26th; greatest monthly range, 68, at Fort Wingate; least monthly range, 40, at Santa Fe.

Precipitation.—Greatest monthly, 0.30, at Hot Sulphur Springs; least monthly, 0.00, at seven stations.—*H. B. Hersey, Observer, Weather Bureau, Santa Fe, director.*

NEW YORK.

Temperature.—The mean was 2.8 above the normal; maximum, 86, at Humphrey, 12th; minimum, 12, at Brookfield, 31st; greatest monthly range, 65, at Humphrey; least monthly range, 39, at Setauket.

Precipitation.—The average was 0.72 below the normal; greatest monthly, 5.75, at Cherry Creek; least monthly, 0.63, at Ogdensburg.

Wind.—Prevailing direction, southwest.—*Prof. E. A. Fuytes, Dean of the College of Civil Engineering, Cornell University, Ithaca, director; R. M. Hardinge, Observer, Weather Bureau, assistant.*

NORTH CAROLINA.

Temperature.—The mean was 0.6 below the normal; maximum, 92, at Lumberton, 8th; minimum, 18, at Bakersville, 30th; greatest monthly range, 66, at Bakersville and Marion; least monthly range, 30, at Hatteras.

Precipitation.—The average was 1.86 above the normal; greatest monthly, 11.31, at Columbus; least monthly, 0.75, at Murphy.

Wind.—Prevailing direction, northeast.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Observer, Weather Bureau, assistant.*

NORTH DAKOTA.

Temperature.—The mean was 1.8 below the normal; maximum, 79, at Washburn, 31st; minimum, 0, at Washburn, 28th; greatest monthly range, 79, at Washburn; least monthly range, 47, at Saint John.

Precipitation.—The average was 0.50 below the normal; greatest monthly, 1.70, at Milton; least monthly, 0.37, at Dickinson.

Wind.—Prevailing direction, northwest.—*W. H. Fallon, Observer, Weather Bureau, Bismarck, director.*

OHIO WEATHER AND CROP SERVICE.

Temperature.—The mean was 2.1 above the normal; maximum, 95, at Northwood, 11th; minimum, 15, at Rittman, 28th; greatest monthly range, 75, at Northwood; least monthly range, 50, at Sharon Center.

Precipitation.—The average was 1.62 above the normal; greatest monthly, 7.25, at Zanesville; least monthly, 2.09, at Celina.

Wind.—Prevailing direction, southwest.—*L. N. Bonham, Columbus, director; C. M. Strong, Observer, Weather Bureau, assistant.*

OKLAHOMA.

Temperature.—Maximum, 99, at Guthrie, 2d; minimum, 24, at Burnett, 26th.

Precipitation.—Greatest monthly, 0.90, at Buffalo; least monthly, trace, at Winnview.

Wind.—Prevailing direction, south.—*J. I. Widmeyer, Observer, Weather Bureau, Oklahoma City, director.*

OREGON.

Temperature.—The mean was 3.6 below the normal; maximum, 78, at Canyon City, 14th; minimum, 12, at Lone Rock, 31st; greatest monthly range, 53, at Canyon City and Lone Rock; least monthly range, 25, at Bandon.

Precipitation.—The average was 1.81 above the normal; greatest monthly, 15.57, at Glenora; least monthly, 1.04, at Burns.

Wind.—Prevailing direction, southwest.—*Hon. H. E. Hayes, Master State Grange, Portland, director; B. S. Pague, Local Forecast Official, Weather Bureau, assistant.*

PENNSYLVANIA.

Temperature.—The mean was 3.1 above the normal; maximum, 91, at Coatesville, 9th; minimum, 17, at Hollidaysburg and Smethport, 31st; greatest monthly range, 69, at Coatesville and Lagonia; least monthly range, 42, at Altoona.

Precipitation.—The average was 0.22 below the normal; greatest monthly, 6.58, at Blue Knob; least monthly, 1.18, at Bloomsburg.

Wind.—Prevailing direction, northwest.—*Under direction of the Franklin Institute, Philadelphia; W. P. Tatham, director; T. F. Townsend, Local Forecast Official, Weather Bureau, assistant.*

SOUTH CAROLINA.

Temperature.—Maximum, 90, at Trial and Kingstree, 10th; minimum, 25, at Greenville, 31st.

Precipitation.—Greatest monthly, 8.16, at Hardeeville; least monthly, 0.72, at Greenwood.

Wind.—Prevailing direction, northeast.—*J. W. Bauer, Observer, Weather Bureau, Columbia, director.*

SOUTH DAKOTA.

Temperature.—The mean was 0.5 below the normal; maximum, 90, at Oelrichs, 21st; minimum, 2, at Webster and Wentworth, 29th; greatest monthly range, 81, at Webster; least monthly range, 50, at Bear Valley.

Precipitation.—The average was 0.33 below the normal; greatest monthly, 4.70, at Forest City; least monthly, trace, at De Smet.

Wind.—Prevailing direction, northwest.—*S. W. Glenn, Local Forecast Official, Weather Bureau, Huron, director.*

TENNESSEE WEATHER AND CROP SERVICE.

Temperature.—The mean was 0.6 below the normal; maximum, 90, at Covington, 21st; minimum, 22, at Jacksboro, 30th, and at Harriman, 31st; greatest monthly range, 65, at Springdale; least monthly range, 41, at Bethel Springs.

Precipitation.—The average was 0.89 below the normal; greatest monthly, 5.85, at Johnson City; least monthly, trace, at Bethel Springs.

Wind.—Prevailing direction, north.—*J. B. Marbury, Local Forecast Official, Weather Bureau, Nashville, director.*

TEXAS.

Temperature.—The mean was 0.5 above the normal; maximum, 101, at Fort Ringgold, 2d, and at Sulphur Springs, 9th; minimum, 22, at Fort Hancock, 26th and 28th; greatest monthly range, 69, at Sulphur Springs; least monthly range, 27, at Galveston.

Precipitation.—The average was 1.81 below the normal; greatest monthly, 3.09, at Llano; least monthly, 0.00, at a number of stations.

Wind.—Prevailing direction, south.—*D. D. Bryan, Galveston, director; I. M. Cline, Local Forecast Official, Weather Bureau, assistant.*

UTAH.

Temperature.—Maximum, 92, at Fillmore, 8th; minimum, 5, at Scofield,

11th; greatest monthly range, 71, at Fillmore; least monthly range, 47, at Castle Gate and Salt Lake City.

Precipitation.—Greatest monthly, 1.46, at Lake Park; least monthly, 0.00, at Loa and Green River.

Wind.—Prevailing direction, southeast.—*G. N. Salisbury, Observer, Weather Bureau, Salt Lake City, director.*

VIRGINIA.

Temperature.—Maximum, 89, at Ashland and Avon, 9th; minimum, 19, at Big Stone Gap, Lexington, and Marion, 30th; greatest monthly range, 63, at Big Stone Gap; least monthly range, 35, at Cape Henry.

Precipitation.—Greatest monthly, 12.61, at Avon; least monthly, 2.10, at Cape Henry.

Wind.—Prevailing direction, northeast.—*Dr. E. A. Craighill, Lynchburg, director; J. N. Ryker, Observer, Weather Bureau, assistant.*

WASHINGTON.

Temperature.—Maximum, 83, at Davenport, 26th; minimum, 12, at Waterville, 23d; greatest monthly range, 70, at Davenport; least monthly range, 16, at Tatoosh Island.

Precipitation.—The average was 0.59 above the normal; greatest monthly, 11.44, at Neah Bay; least monthly, 0.19, at Bridgeport.

Wind.—Prevailing direction, south.—*H. F. Alciatore, Observer, Weather Bureau, Olympia, director.*

WEST VIRGINIA.

Temperature.—Maximum, 86, at Buckhannon and New Martinsville, 12th, and at Point Pleasant, 11th; minimum, 16, at Marlinton, 31st; greatest monthly range, 66, at Central Station; least monthly range, 50, at Ella.

Precipitation.—Greatest monthly, 7.22, at Bluefield; least monthly, 2.95, at Grafton.

Wind.—Prevailing direction, west.—*W. W. Dent, Observer, Weather Bureau, Parkersburg, director.*

WISCONSIN.

Temperature.—The mean was 2.0 above the normal; maximum, 89, at Prairie du Chien, 8th; minimum, 7, at Haywood, 29th.

Precipitation.—The average was 0.50 below the normal; greatest monthly, 5.22, at Ashland; least monthly, 1.37, at Manitowoc.

Wind.—Prevailing directions, south and southwest.—*W. L. Moore, Local Forecast Official, Weather Bureau, Milwaukee, director.*

WYOMING.

Temperature.—Maximum, 82, at Fort Yellowstone, 16th; minimum, 9, at Laramie, 26th; greatest monthly range, 60, at Cheyenne; least monthly range, 51, at Saratoga.

Precipitation.—Greatest monthly, 2.20, at Saratoga; least monthly, 0.18, at Fort Washakie.

Wind.—Prevailing directions, west.—*E. M. Ravenscraft, Observer, Weather Bureau, Cheyenne, director.*

OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received a number of reports for October from the captains of 39 vessels navigating the Great Lakes. The following miscellaneous items are extracted from their reports.

Capt. Frank D. Root, s. s. "Maritana," reports on October 14, p. m., at the entrance to Detroit River, water so low could not go up the river.

Capt. F. A. Graves, s. s. "Maton," navigating Lakes Michigan and Superior, reports October 5, northeast gale continuing over to the 6th, and northwest gale October 7. Also a north-northwest gale October 14-15.

Capt. Thos. Hackett, s. s. "Volunteer," Saginaw Bay, on October 5, reports northern lights shone very plainly from 10 p. m. till midnight. On October 1 he states that "the Bell buoy off Point aux Barques in my judgment is of much benefit to boats passing in the thick weather and dark nights, and I think more of them could be used on the Lakes with good results, one off Sturgeon Point, and one off Middle Island reef, Lake Huron, would be of much benefit to passing boats, and one off Wangoshanee light, and wherever boats have to pass close to shoal places they are of much benefit."

Capt. Hugh O. Miller, s. s. "Conemaugh," on Lake Erie, reports October 6, noon, barometer the lowest I ever saw it.

Capt. J. W. Morgan, s. s. "Australasia," on Lake Michigan, October 6, aurora very bright 8.30 p. m.

Capt. Edward Mooney of the s. s. "Wa-Wa-Tam," on Lake Superior, reports October 5, northern lights from 3 a. m. until 4 a. m.

Capt. R. E. Gain, s. s. "W. H. Sawyer," on Lake Michigan, reports October 3, 11 p. m., bright flashing northern lights. Reports also important obstacle in the channel just west of waterworks crib, abreast of Buffalo.

Capt. James Parsons, s. s. "Charles Hebard," on Lake Michigan, reports on October 1, 10 p. m., a most beautiful and well-defined aurora visible, not a cloud in the sky although the wind was blowing 7 miles from southeast

at the time. October 13th and morning of 14th, the barometer the lowest that it has been with us in 7 years.

Capt. John Lowe, s. s. "Kalliyuga," on Lake Huron, reports an important obstruction north of Ashtabula Piers; also another southwest from Point Pelee, Ont., and another southeast from Bar Point, Lake Huron.

Capt. C. W. Woodgrift, s. s. "F. R. Bull," on Lake Michigan, reports an obstruction, the mast of str. "Wocokin," 6 miles above Long Point and about 3 miles from shore.

Capt. Hourigan, s. s. "Hecla," reports frost on the morning of the 10th at Ogdensburg. On the 13th he sailed into Lake Ontario into a heavy sea and southeast gale; his barometer falling rapidly to 28.54. The "Hecla" rolled her smoke stacks out, could not make steam, parted hawsers and went ashore 2 miles east of Wellington. Capt. Hourigan claims that he did not have due notice of this storm or he might have avoided it.

Capt. C. W. Lockwood, s. s. "Beunington," reports October 11, Ashland, Mich., on Lake Superior, thunder and lightning and heavy rain. On the 14th, in the morning, near Whitefish Point, northwest hurricane and heavy cross seas; barometer 28.75 (aneroid, approximately, reduced to sea level). 15th and also 29th, at the lower end of Lake Superior, squalls of snow and hail.

Capt. Fred Howe, s. s. "Aztec," October 11, 8 p. m., to 12th, 8 a. m., on Lake Erie, reports clouds heavy with sheet lightning in the northwest.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the kind co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received 454 weekly transcripts of journals for the month of October from the keepers of 39 U. S. Life-Saving stations on the Great Lakes. The mean pressures, temperatures, and winds will be useful in